

REGULAR ORIGINAL FILING

Application Based on

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**PHOTOGRAPHIC MATERIAL COMPRISING A BICYCLIC
PYRAZOLOTRIAZOLE COUPLER WITH IMPROVED HUE**

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**PHOTOGRAPHIC MATERIAL COMPRISING A BICYCLIC
PYRAZOLOTRIAZOLE COUPLER WITH IMPROVED HUE**

FIELD OF THE INVENTION

5 This invention relates to photographic elements, couplers and processes including novel 1H- pyrazolo[1,5-b][1,2,4]triazole -based couplers having a ring carbon bearing a propionic ester moiety.

BACKGROUND OF THE INVENTION

10 Color images are customarily obtained in the photographic art by reaction between an oxidation product of a silver halide developing agent and a dye-forming coupler. Pyrazolones are useful for forming magenta dye images; however, such couplers have shortcomings with respect to color reproduction in that the unwanted absorption around 430 nm causes color turbidity. Bicyclic
15 pyrazolo couplers, particularly pyrazolotriazole couplers, represent another class of couplers for this purpose. Examples of pyrazoloazole couplers are described in, for example, U.S. Patent Nos. 4,443,536. 4,665,015; 4,514, 490; 4,621,046, 4,540,654; 4,590,153; 4,822,730 and European Patents 177, 765 and 119,860. One class of pyrazolotriazole couplers includes 1H- pyrazolo[3,2-c][1,2,4]triazole
20 couplers and another includes 1H- pyrazolo[1,5-b][1,2,4]triazole couplers, such as described in European Patent 177,765. While these couplers have a reduced level of unwanted absorption, the spectral absorption is often deeper having absorption maxima at higher wavelengths than is desired. Frequently addenda must be added to bring the hue into a usable range.

25 It is a problem to be solved to provide 1H- pyrazolo[1,5-b][1,2,4]triazole couplers that exhibit desirable hue characteristics.

SUMMARY OF THE INVENTION

30 The present invention provides a photographic element comprising a light sensitive silver halide emulsion layer and, having associated with that layer a 1H-pyrazo[1,5-b]-1,2,4-triazole dye forming coupler having a fully substituted

carbon atom at the 6-position, a chloro group at the 7-position, and, at the 2-position, a propionic ester moiety.

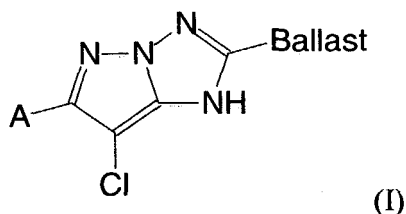
It has been found that photographic elements containing these couplers exhibit desirable hue characteristics.

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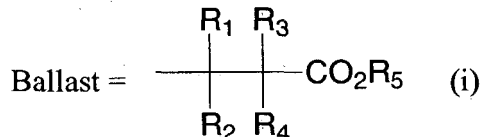
DETAILED DESCRIPTION OF THE INVENTION

Suitably, the couplers of the invention are 1H- pyrazolo[1,5-b][1,2,4]triazoles with a fully substituted carbon atom at the 6-position and a chloro group at the 7-position

10



and contain a ballasting substituent in the 2-position according to formula (i)



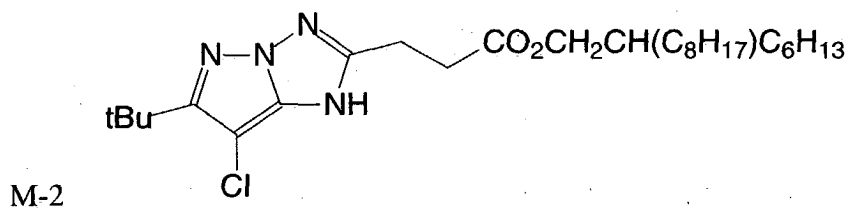
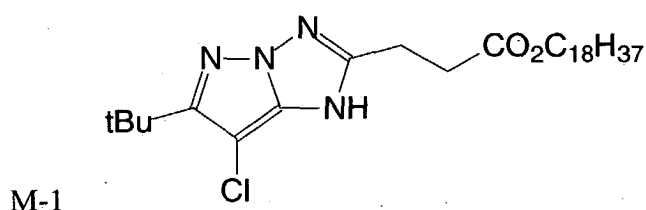
wherein A is a fully substituted carbon atom, R₁, R₂, R₃, and R₄ are independently
15 a hydrogen or a branched or unbranched, substituted or unsubstituted, alky, aryl, or heterocyclic group and R₅ is a branched or unbranched, substituted or unsubstituted, alky group. Suitably, R₁, R₂, R₃, R₄, and R₅ may be a group known in the art that typically promotes solubility, diffusion resistance, or dye stability of the dye formed upon reaction of the coupler with the oxidized color developing
20 agent.

A is preferably a carbon atom substituted with unsubstituted alkyl or aryl groups and more preferably a carbon atom substituted with unsubstituted alkyl or aryl groups containing eight carbons or less and most preferably being tertiary butyl. R₁, R₂, R₃, and R₄ are independently hydrogen or an alkyl or aryl
25 groups, substituted or unsubstituted and branched or unbranched but preferably hydrogen or an unsubstituted alkyl or aryl groups and more preferably hydrogen

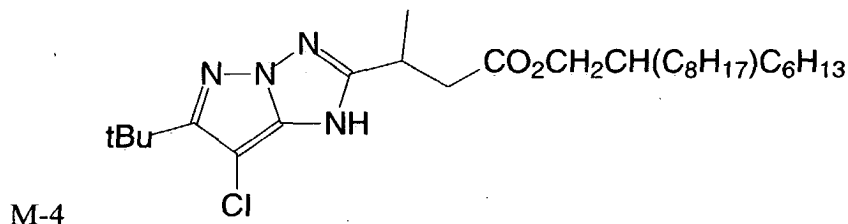
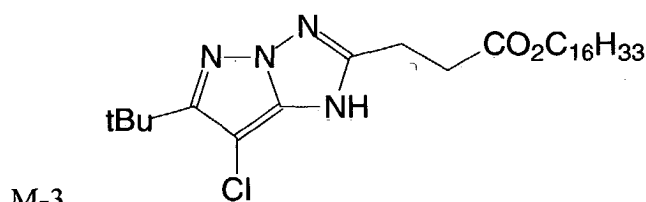
or an unsubstituted alkyl groups and most preferably hydrogen or methyl or ethyl groups. In addition any of R_1 , R_2 , R_3 , and R_4 may be linked to form a saturated ring. R_5 may be a branched or unbranched alkyl group substituted or unsubstituted but preferably a unsubstituted branched or unbranched group and more preferably unsubstituted and branched or unbranched with from 6 to 20 carbons and most preferably unsubstituted branched or unbranched with from 12 to 18 carbons.

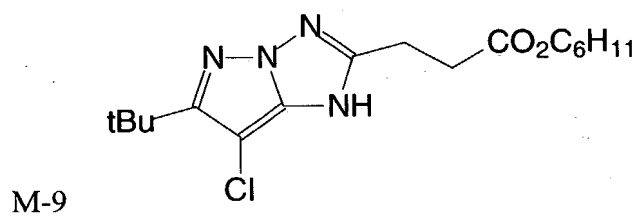
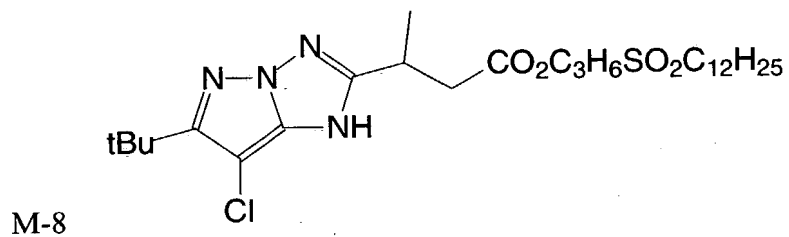
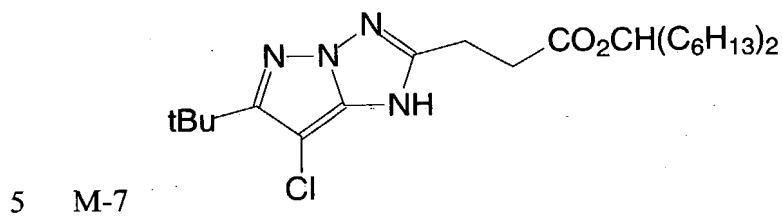
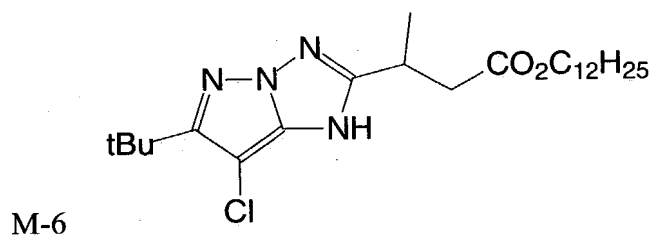
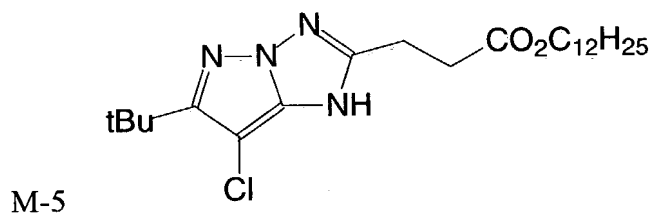
Examples of the invention are shown below but are not limited to these:

10

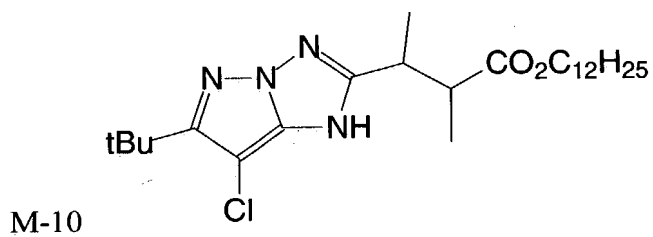


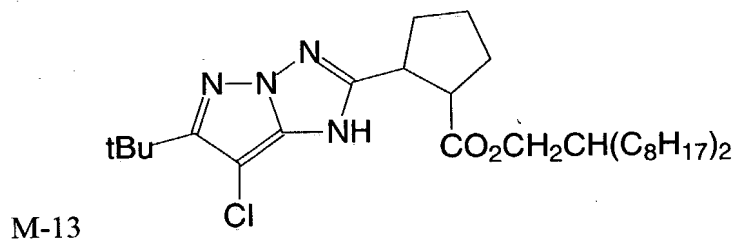
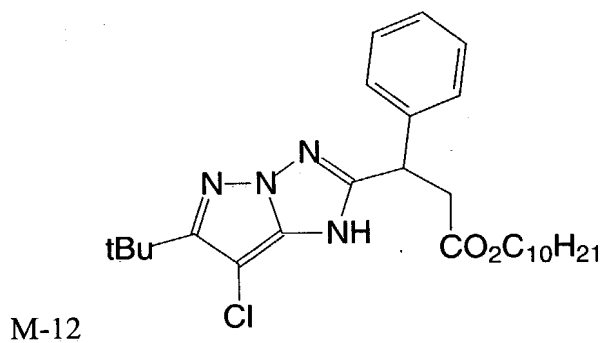
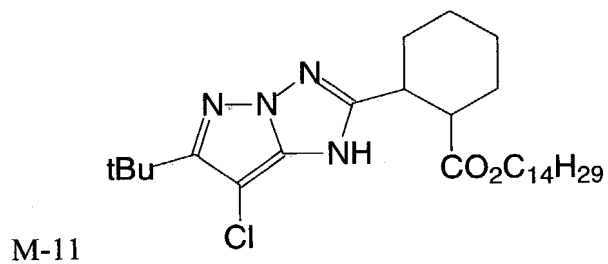
15



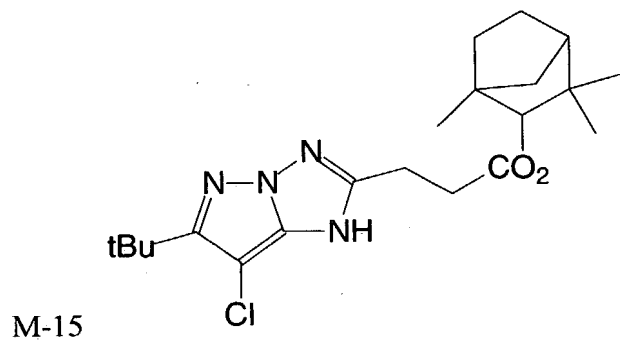
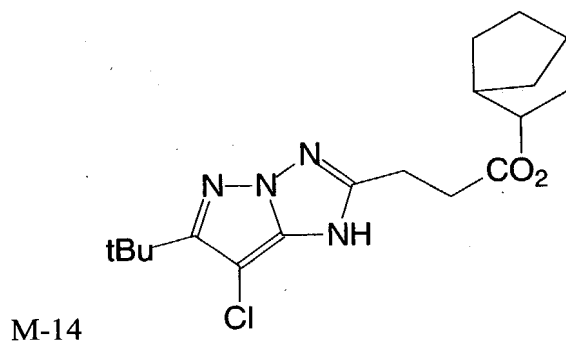


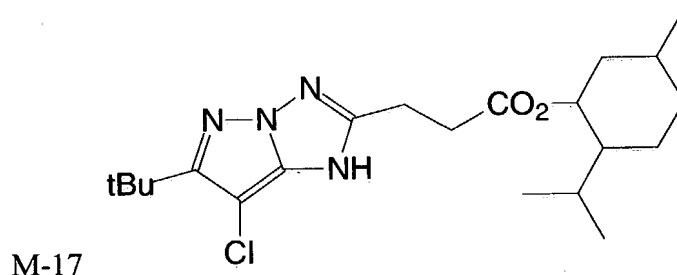
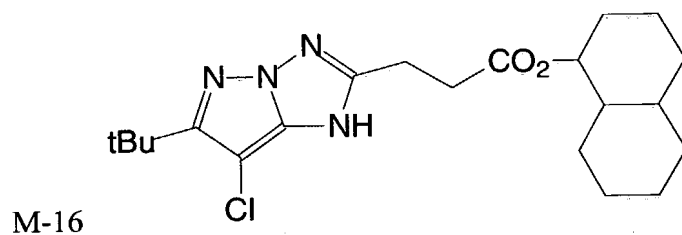
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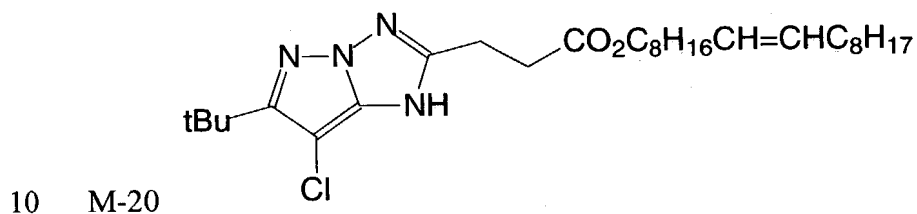
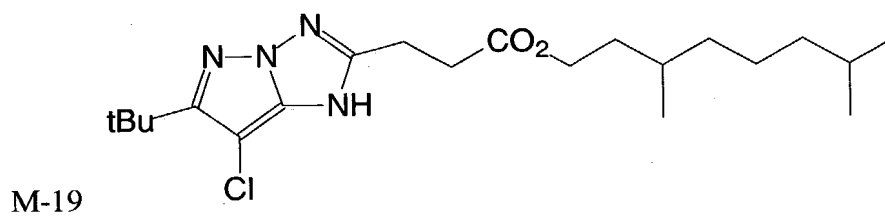
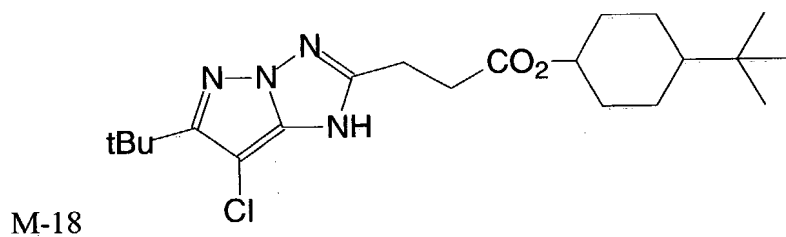


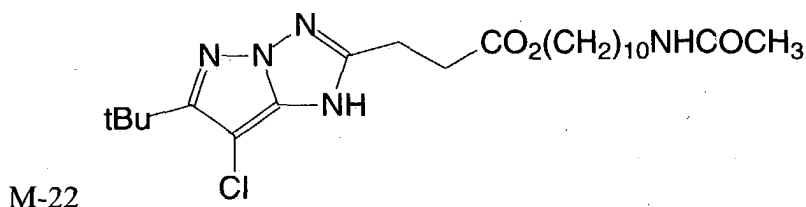
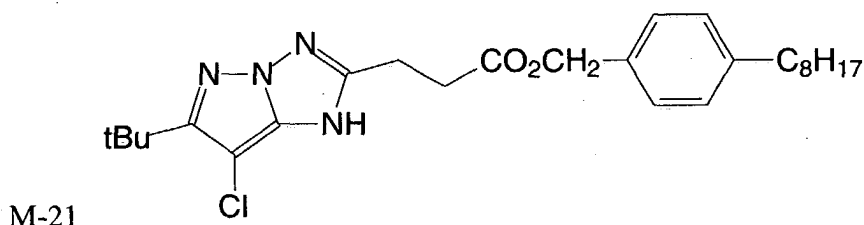
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Besides good hue, embodiments of the invention exhibit good speed, dye light stability and activity.

- 5 Unless otherwise specifically stated, use of the term "substituted" or "substituent" means any group or atom other than hydrogen. Unless otherwise provided, when a group, compound or formula containing a substitutable hydrogen is referred to, it is also intended to encompass not only the unsubstituted form, but also form further substituted with any substituent group or groups as
- 10 herein mentioned, so long as the substituent does not destroy properties necessary for utility. Suitably, a substituent group may be halogen or may be bonded to the remainder of the molecule by an atom of carbon, silicon, oxygen, nitrogen, phosphorous, or sulfur. The substituent may be, for example, halogen, such as chloro, bromo or fluoro; nitro; hydroxyl; cyano; carboxyl; or groups which may
- 15 be further substituted, such as alkyl, including straight or branched chain or cyclic alkyl, such as methyl, trifluoromethyl, ethyl, *t*-butyl, 3-(2,4-di-*t*-pentylphenoxy) propyl, cyclohexyl, and tetradecyl; alkenyl, such as ethylene, 2-butene; alkoxy, such as methoxy, ethoxy, propoxy, butoxy, 2-methoxyethoxy, *sec*-butoxy, hexyloxy, 2-ethylhexyloxy, tetradecyloxy, 2-(2,4-di-*t*-pentylphenoxy)ethoxy, and
- 20 2-dodecyloxyethoxy; aryl such as phenyl, 4-*t*-butylphenyl, 2,4,6-trimethylphenyl, naphthyl; aryloxy, such as phenoxy, 2-methylphenoxy, alpha- or beta-naphthyloxy, and 4-tolyloxy; carbonamido, such as acetamido, benzamido, butyramido, tetradecanamido, alpha-(2,4-di-*t*-pentyl-phenoxy)acetamido, alpha-(2,4-di-*t*-pentylphenoxy)butyramido, alpha-(3-pentadecylphenoxy)-hexanamido,
- 25 alpha-(4-hydroxy-3-*t*-butylphenoxy)-tetradecanamido, 2-oxo-pyrrolidin-1-yl, 2-

- oxo-5-tetradecylpyrrolin-1-yl, N-methyltetradecanamido, N-succinimido, N-phthalimido, 2,5-dioxo-1-oxazolidinyl, 3-dodecyl-2,5-dioxo-1-imidazolyl, and N-acetyl-N-dodecylamino, ethoxycarbonylamino, phenoxycarbonylamino, benzyloxycarbonylamino, hexadecyloxycarbonylamino, 2,4-di-*t*-
- 5 butylphenoxycarbonylamino, phenylcarbonylamino, 2,5-(di-*t*-pentylphenyl)carbonylamino, *p*-dodecyl-phenylcarbonylamino, *p*-tolylcarbonylamino, N-methylureido, N,N-dimethylureido, N-methyl-N-dodecylureido, N-hexadecylureido, N,N-dioctadecylureido, N,N-dioctyl-N'-ethylureido, N-phenylureido, N,N-diphenylureido, N-phenyl-N-*p*-tolylureido, N-
- 10 (*m*-hexadecylphenyl)ureido, N,N-(2,5-di-*t*-pentylphenyl)-N'-ethylureido, and *t*-butylcarbonamido; sulfonamido, such as methylsulfonamido, benzenesulfonamido, *p*-tolylsulfonamido, *p*-dodecylbenzenesulfonamido, N-methyltetradecylsulfonamido, N,N-dipropyl-sulfamoylamino, and hexadecylsulfonamido; sulfamoyl, such as N-methylsulfamoyl, N-ethylsulfamoyl,
- 15 N,N-dipropylsulfamoyl, N-hexadecylsulfamoyl, N,N-dimethylsulfamoyl; N-[3-(dodecyloxy)propyl]sulfamoyl, N-[4-(2,4-di-*t*-pentylphenoxy)butyl]sulfamoyl, N-methyl-N-tetradecylsulfamoyl, and N-dodecylsulfamoyl; carbamoyl, such as N-methylcarbamoyl, N,N-dibutylcarbamoyl, N-octadecylcarbamoyl, N-[4-(2,4-di-*t*-pentylphenoxy)butyl]carbamoyl, N-methyl-N-tetradecylcarbamoyl, and N,N-
- 20 dioctylcarbamoyl; acyl, such as acetyl, (2,4-di-*t*-amylphenoxy)acetyl, phenoxycarbonyl, *p*-dodecyloxyphenoxycarbonyl methoxycarbonyl, butoxycarbonyl, tetradecyloxycarbonyl, ethoxycarbonyl, benzyloxycarbonyl, 3-pentadecyloxycarbonyl, and dodecyloxycarbonyl; sulfonyl, such as methoxysulfonyl, octyloxysulfonyl, tetradecyloxysulfonyl, 2-
- 25 ethylhexyloxysulfonyl, phenoxysulfonyl, 2,4-di-*t*-pentylphenoxysulfonyl, methylsulfonyl, octylsulfonyl, 2-ethylhexylsulfonyl, dodecylsulfonyl, hexadecylsulfonyl, phenylsulfonyl, 4-nonylphenylsulfonyl, and *p*-tolylsulfonyl; sulfonyloxy, such as dodecylsulfonyloxy, and hexadecylsulfonyloxy; sulfinyl, such as methylsulfinyl, octylsulfinyl, 2-ethylhexylsulfinyl, dodecylsulfinyl,
- 30 hexadecylsulfinyl, phenylsulfinyl, 4-nonylphenylsulfinyl, and *p*-tolylsulfinyl; thio, such as ethylthio, octylthio, benzylthio, tetradecylthio, 2-(2,4-di-*t*-pentylphenoxy)ethylthio, phenylthio, 2-butoxy-5-*t*-octylphenylthio, and *p*-

tolylthio; acyloxy, such as acetyloxy, benzoyloxy, octadecanoyloxy, *p*-
dodecylamidobenzoyloxy, N-phenylcarbamoyloxy, N-ethylcarbamoyloxy, and
cyclohexylcarbonyloxy; amine, such as phenylanilino, 2-chloroanilino,
diethylamine, dodecylamine; imino, such as 1 (N-phenylimido)ethyl, N-
5 succinimido or 3-benzylhydantoinyl; phosphate, such as dimethylphosphate and
ethylbutylphosphate; phosphite, such as diethyl and dihexylphosphite; a
heterocyclic group, a heterocyclic oxy group or a heterocyclic thio group, each of
which may be substituted and which contain a 3 to 7 membered heterocyclic ring
composed of carbon atoms and at least one hetero atom selected from the group
10 consisting of oxygen, nitrogen and sulfur, such as 2-furyl, 2-thienyl, 2-
benzimidazolyloxy or 2-benzothiazolyl; quaternary ammonium, such as
triethylammonium; and silyloxy, such as trimethylsilyloxy.

If desired, the substituents may themselves be further substituted
one or more times with the described substituent groups. The particular
15 substituents used may be selected by those skilled in the art to attain the desired
desirable properties for a specific application and can include, for example,
hydrophobic groups, solubilizing groups, blocking groups, and releasing or
releasable groups. When a molecule may have two or more substituents, the
substituents may be joined together to form a ring such as a fused ring unless
20 otherwise provided. Generally, the above groups and substituents thereof may
include those having up to 48 carbon atoms, typically 1 to 36 carbon atoms and
usually less than 24 carbon atoms, but greater numbers are possible depending on
the particular substituents selected.

The materials useful in the invention can be used in any of the
25 ways and in any of the combinations known in the art. Typically, the invention
materials are incorporated in a melt and coated as a layer described herein on a
support to form part of a photographic element. When the term "associated" is
employed, it signifies that a reactive compound is in or adjacent to a specified
layer where, during processing, it is capable of reacting with other components.

30 To control the migration of various components, it may be
desirable to include a high molecular weight hydrophobe or "ballast" group in
coupler molecules. Representative ballast groups include substituted or

unsubstituted alkyl or aryl groups containing 8 to 48 carbon atoms.

Representative substituents on such groups include alkyl, aryl, alkoxy, aryloxy, alkylthio, hydroxy, halogen, alkoxycarbonyl, aryloxcarbonyl, carboxy, acyl, acyloxy, amino, anilino, carbonamido, carbamoyl, alkylsulfonyl, arylsulfonyl, sulfonamido, and sulfamoyl groups wherein the substituents typically contain 1 to 42 carbon atoms. Such substituents can also be further substituted.

The photographic elements can be single color elements or multicolor elements. Multicolor elements contain image dye-forming units sensitive to each of the three primary regions of the spectrum. Each unit can comprise a single emulsion layer or multiple emulsion layers sensitive to a given region of the spectrum. The layers of the element, including the layers of the image-forming units, can be arranged in various orders as known in the art. In an alternative format, the emulsions sensitive to each of the three primary regions of the spectrum can be disposed as a single segmented layer.

A typical multicolor photographic element comprises a support bearing a cyan dye image-forming unit comprising one or more red-sensitive silver halide emulsion layers, each layer having associated therewith or preferably containing a cyan dye-forming coupler, a magenta dye image-forming unit comprising one or more green-sensitive silver halide emulsion layers, each layer having associated therewith or preferably containing a magenta dye-forming coupler, and a yellow dye image-forming unit comprising one or more blue-sensitive silver halide emulsion layers, each layer having associated therewith or preferably containing a yellow dye-forming coupler. The element can contain additional layers, such as filter layers, interlayers, overcoat layers, and subbing layers.

If desired, the photographic element can be used in conjunction with an applied magnetic layer as described in Research Disclosure, November 1992, Item 34390 published by Kenneth Mason Publications, Ltd., Dudley Annex, 12a North Street, Emsworth, Hampshire P010 7DQ, ENGLAND, and as described in Hatsumi Kyoukai Koukai Gihou No. 94-6023, published March 15, 1994, available from the Japanese Patent Office. When it is desired to employ the

inventive materials in a small format film, Research Disclosure, June 1994, Item 36230, provides suitable embodiments.

In the following discussion of suitable materials for use in the emulsions and elements of this invention, reference will be made to Research
5 Disclosure, September 1996, Item 38957, available as described above, which is referred to herein by the term "Research Disclosure". The Sections hereinafter referred to are Sections of the Research Disclosure.

Except as provided, the silver halide emulsion containing elements employed in this invention can be either negative-working or positive-working as
10 indicated by the type of processing instructions (i.e. color negative, reversal, or direct positive processing) provided with the element. Suitable emulsions and their preparation as well as methods of chemical and spectral sensitization are described in Sections I through V. Various additives such as UV dyes,
15 brighteners, antifoggants, stabilizers, light absorbing and scattering materials, and physical property modifying addenda such as hardeners, coating aids, plasticizers, lubricants and matting agents are described, for example, in Sections II and VI through VIII. Color materials are described in Sections X through XIII. Suitable methods for incorporating couplers and dyes, including dispersions in organic solvents, are described in Section X(E). Scan facilitating is described in Section
20 XIV. Supports, exposure, development systems, and processing methods and agents are described in Sections XV to XX. The information contained in the September 1994 Research Disclosure, Item No. 36544 referenced above, is updated in the September 1996 Research Disclosure, Item No. 38957. Certain desirable photographic elements and processing steps, including those useful in
25 conjunction with color reflective prints, are described in Research Disclosure, Item 37038, February 1995.

Image dye-forming couplers may be included in the element such as couplers that form cyan dyes upon reaction with oxidized color developing agents which are described in such representative patents and publications as:
30 "Farbkuppler-eine Literature Übersicht," published in Agfa Mitteilungen, Band III, pp. 156-175 (1961) as well as in U.S. Patent Nos. 2,367,531; 2,423,730; 2,474,293; 2,772,162; 2,895,826; 3,002,836; 3,034,892; 3,041,236; 4,333,999;

4,746,602; 4,753,871; 4,770,988; 4,775,616; 4,818,667; 4,818,672; 4,822,729;
4,839,267; 4,840,883; 4,849,328; 4,865,961; 4,873,183; 4,883,746; 4,900,656;
4,904,575; 4,916,051; 4,921,783; 4,923,791; 4,950,585; 4,971,898; 4,990,436;
4,996,139; 5,008,180; 5,015,565; 5,011,765; 5,011,766; 5,017,467; 5,045,442;
5 5,051,347; 5,061,613; 5,071,737; 5,075,207; 5,091,297; 5,094,938; 5,104,783;
5,178,993; 5,813,729; 5,187,057; 5,192,651; 5,200,305 5,202,224; 5,206,130;
5,208,141; 5,210,011; 5,215,871; 5,223,386; 5,227,287; 5,256,526; 5,258,270;
5,272,051; 5,306,610; 5,326,682; 5,366,856; 5,378,596; 5,380,638; 5,382,502;
5,384,236; 5,397,691; 5,415,990; 5,434,034; 5,441,863; EPO 0 246 616;
10 EPO 0 250 201; EPO 0 271 323; EPO 0 295 632; EPO 0 307 927; EPO 0 333 185;
EPO 0 378 898; EPO 0 389 817; EPO 0 487 111; EPO 0 488 248; EPO 0 539 034;
EPO 0 545 300; EPO 0 556 700; EPO 0 556 777; EPO 0 556 858; EPO 0 569 979;
EPO 0 608 133; EPO 0 636 936; EPO 0 651 286; EPO 0 690 344; German OLS
4,026,903; German OLS 3,624,777. and German OLS 3,823,049. Typically such
15 couplers are phenols, naphthols, or pyrazoloazoles.

Couplers that form magenta dyes upon reaction with oxidized color
developing agent are described in such representative patents and publications as:
"Farbkuppler-eine Literature Übersicht," published in Agfa Mitteilungen, Band
III, pp. 126-156 (1961) as well as U.S. Patents 2,311,082 and 2,369,489;
20 2,343,701; 2,600,788; 2,908,573; 3,062,653; 3,152,896; 3,519,429; 3,758,309;
3,935,015; 4,540,654; 4,745,052; 4,762,775; 4,791,052; 4,812,576; 4,835,094;
4,840,877; 4,845,022; 4,853,319; 4,868,099; 4,865,960; 4,871,652; 4,876,182;
4,892,805; 4,900,657; 4,910,124; 4,914,013; 4,921,968; 4,929,540; 4,933,465;
4,942,116; 4,942,117; 4,942,118; U.S. Patent 4,959,480; 4,968,594; 4,988,614;
25 4,992,361; 5,002,864; 5,021,325; 5,066,575; 5,068,171; 5,071,739; 5,100,772;
5,110,942; 5,116,990; 5,118,812; 5,134,059; 5,155,016; 5,183,728; 5,234,805;
5,235,058; 5,250,400; 5,254,446; 5,262,292; 5,300,407; 5,302,496; 5,336,593;
5,350,667; 5,395,968; 5,354,826; 5,358,829; 5,368,998; 5,378,587; 5,409,808;
5,411,841; 5,418,123; 5,424,179; EPO 0 257 854; EPO 0 284 240; EPO
30 0 341 204; EPO 347,235; EPO 365,252; EPO 0 422 595; EPO 0 428 899; EPO
0 428 902; EPO 0 459 331; EPO 0 467 327; EPO 0 476 949; EPO 0 487 081;
EPO 0 489 333; EPO 0 512 304; EPO 0 515 128; EPO 0 534 703; EPO 0 554 778;

EPO 0 558 145; EPO 0 571 959; EPO 0 583 832; EPO 0 583 834; EPO 0 584 793;
EPO 0 602 748; EPO 0 602 749; EPO 0 605 918; EPO 0 622 672; EPO 0 622 673;
EPO 0 629 912; EPO 0 646 841, EPO 0 656 561; EPO 0 660 177; EPO 0 686 872;
WO 90/10253; WO 92/09010; WO 92/10788; WO 92/12464; WO 93/01523; WO
5 93/02392; WO 93/02393; WO 93/07534; UK Application 2,244,053; Japanese
Application 03192-350; German OLS 3,624,103; German OLS 3,912,265; and
German OLS 40 08 067. Typically such couplers are pyrazolones,
pyrazoloazoles, or pyrazolobenzimidazoles that form magenta dyes upon reaction
with oxidized color developing agents.

10 Couplers that form yellow dyes upon reaction with oxidized color
developing agent are described in such representative patents and publications as:
"Farbkuppler-eine Literature Übersicht," published in Agfa Mitteilungen; Band
III; pp. 112-126 (1961); as well as U.S. Patent 2,298,443; 2,407,210; 2,875,057;
3,048,194; 3,265,506; 3,447,928; 4,022,620; 4,443,536; 4,758,501; 4,791,050;
15 4,824,771; 4,824,773; 4,855,222; 4,978,605; 4,992,360; 4,994,361; 5,021,333;
5,053,325; 5,066,574; 5,066,576; 5,100,773; 5,118,599; 5,143,823; 5,187,055;
5,190,848; 5,213,958; 5,215,877; 5,215,878; 5,217,857; 5,219,716; 5,238,803;
5,283,166; 5,294,531; 5,306,609; 5,328,818; 5,336,591; 5,338,654; 5,358,835;
5,358,838; 5,360,713; 5,362,617; 5,382,506; 5,389,504; 5,399,474; 5,405,737;
20 5,411,848; 5,427,898; EPO 0 327 976; EPO 0 296 793; EPO 0 365 282;
EPO 0 379 309; EPO 0 415 375; EPO 0 437 818; EPO 0 447 969; EPO 0 542 463;
EPO 0 568 037; EPO 0 568 196; EPO 0 568 777; EPO 0 570 006; EPO 0 573 761;
EPO 0 608 956; EPO 0 608 957; and EPO 0 628 865. Such couplers are typically
open chain ketomethylene compounds.

25 Couplers that form colorless products upon reaction with oxidized
color developing agent are described in such representative patents as:
UK. 861,138; U.S. Pat. Nos. 3,632,345; 3,928,041; 3,958,993 and 3,961,959.
Typically such couplers are cyclic carbonyl containing compounds that form
colorless products on reaction with an oxidized color developing agent.

30 Couplers that form black dyes upon reaction with oxidized color
developing agent are described in such representative patents as U.S. Patent Nos.
1,939,231; 2,181,944; 2,333,106; and 4,126,461; German OLS No. 2,644,194 and

German OLS No. 2,650,764. Typically, such couplers are resorcinols or *m*-aminophenols that form black or neutral products on reaction with oxidized color developing agent.

In addition to the foregoing, so-called "universal" or "washout"
5 couplers may be employed. These couplers do not contribute to image dye-formation. Thus, for example, a naphthol having an unsubstituted carbamoyl or one substituted with a low molecular weight substituent at the 2- or 3- position may be employed. Couplers of this type are described, for example, in U.S. Patent Nos. 5,026,628, 5,151,343, and 5,234,800.

10 It may be useful to use a combination of couplers any of which may contain known ballasts or coupling-off groups such as those described in U.S. Patent 4,301,235; U.S. Patent 4,853,319 and U.S. Patent 4,351,897. The coupler may contain solubilizing groups such as described in U.S. Patent 4,482,629. The coupler may also be used in association with "wrong" colored couplers (e.g. to
15 adjust levels of interlayer correction) and, in color negative applications, with masking couplers such as those described in EP 213,490; Japanese Published Application 58-172,647; U.S. Patent Nos. 2,983,608; 4,070,191; and 4,273,861; German Applications DE 2,706,117 and DE 2,643,965; UK. Patent 1,530,272; and Japanese Application 58-113935. The masking couplers may be shifted or
20 blocked, if desired.

Typically, couplers are incorporated in a silver halide emulsion layer in a mole ratio to silver of 0.05 to 1.0 and generally 0.1 to 0.5. Usually the couplers are dispersed in a high-boiling organic solvent in a weight ratio of solvent to coupler of 0.1 to 10.0 and typically 0.1 to 2.0 although dispersions
25 using no permanent coupler solvent are sometimes employed.

The invention may be used in association with materials that release Photographically Useful Groups (PUGS) that accelerate or otherwise modify the processing steps e.g. of bleaching or fixing to improve the quality of the image. Bleach accelerator releasing couplers such as those described in EP
30 193,389; EP 301,477; U.S. 4,163,669; U.S. 4,865,956; and U.S. 4,923,784, may be useful. Also contemplated is use in association with nucleating agents, development accelerators or their precursors (UK Patent 2,097,140; UK. Patent

2,131,188); electron transfer agents (U.S. 4,859,578; U.S. 4,912,025); antifogging and anti color-mixing agents such as derivatives of hydroquinones, aminophenols, amines, gallic acid; catechol; ascorbic acid; hydrazides; sulfonamidophenols; and non color-forming couplers.

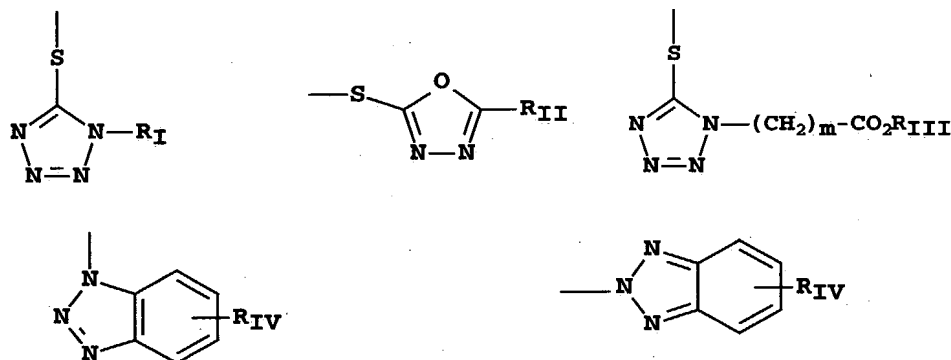
5 The invention may also be used in combination with filter dye layers comprising colloidal silver sol or yellow, cyan, and/or magenta filter dyes, either as oil-in-water dispersions, latex dispersions or as solid particle dispersions. Additionally, they may be used with "smearing" couplers (e.g. as described in U.S. 4,366,237; EP 96,570; U.S. 4,420,556; and U.S. 4,543,323.) Also, the
10 materials useful in the invention may be blocked or coated in protected form as described, for example, in Japanese Application 61/258,249 or U.S. 5,019,492.

 The invention may further be used in combination with image-modifying compounds that release PUGS such as "Developer Inhibitor-Releasing" compounds (DIR's). DIR's useful in conjunction with the invention are known in
15 the art and examples are described in U.S. Patent Nos. 3,137,578; 3,148,022; 3,148,062; 3,227,554; 3,384,657; 3,379,529; 3,615,506; 3,617,291; 3,620,746; 3,701,783; 3,733,201; 4,049,455; 4,095,984; 4,126,459; 4,149,886; 4,150,228; 4,211,562; 4,248,962; 4,259,437; 4,362,878; 4,409,323; 4,477,563; 4,782,012; 4,962,018; 4,500,634; 4,579,816; 4,607,004; 4,618,571; 4,678,739; 4,746,600;
20 4,746,601; 4,791,049; 4,857,447; 4,865,959; 4,880,342; 4,886,736; 4,937,179; 4,946,767; 4,948,716; 4,952,485; 4,956,269; 4,959,299; 4,966,835; 4,985,336 as well as in patent publications GB 1,560,240; GB 2,007,662; GB 2,032,914; GB 2,099,167; DE 2,842,063, DE 2,937,127; DE 3,636,824; DE 3,644,416 as well as the following European Patent Publications: 272,573; 335,319; 336,411; 346,
25 899; 362, 870; 365,252; 365,346; 373,382; 376,212; 377,463; 378,236; 384,670; 396,486; 401,612; 401,613.

 Such compounds are also disclosed in "Developer-Inhibitor-Releasing (DIR) Couplers for Color Photography," C.R. Barr, J.R. Thirtle and P.W. Vittum in Photographic Science and Engineering, Vol. 13, p. 174 (1969).
30 Generally, the developer inhibitor-releasing (DIR) couplers include a coupler moiety and an inhibitor coupling-off moiety (IN). The inhibitor-releasing couplers may be of the time-delayed type (DIAR couplers) which also include a

timing moiety or chemical switch which produces a delayed release of inhibitor.

Examples of typical inhibitor moieties are: oxazoles, thiazoles, diazoles, triazoles, oxadiazoles, thiadiazoles, oxathiazoles, thiatriazoles, benzotriazoles, tetrazoles, benzimidazoles, indazoles, isoindazoles, mercaptotetrazoles, selenotetrazoles, mercaptobenzothiazoles, selenobenzothiazoles, mercaptobenzoxazoles, selenobenzoxazoles, mercaptobenzimidazoles, selenobenzimidazoles, benzodiazoles, mercaptooxazoles, mercapthiadiazoles, mercapthiazoles, mercaptotriazoles, mercaptooxadiazoles, mercaptodiazoles, mercaptooxathiazoles, telleurotetrazoles or benzisodiazoles. In a preferred embodiment, the inhibitor moiety or group is selected from the following formulas:

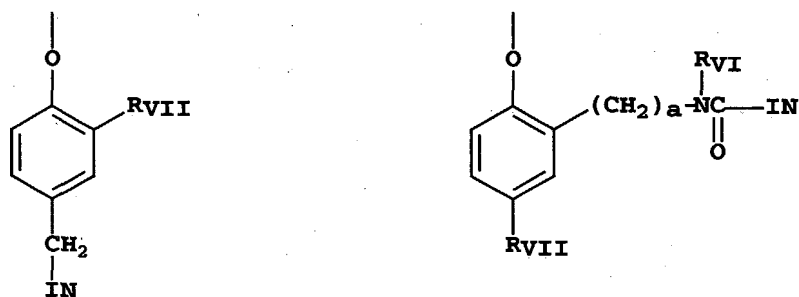


wherein R_I is selected from the group consisting of straight and branched alkyls of from 1 to about 8 carbon atoms, benzyl, phenyl, and alkoxy groups and such groups containing none, one or more than one such substituent; R_{II} is selected from R_I and $-SR_I$; R_{III} is a straight or branched alkyl group of from 1 to about 5 carbon atoms and m is from 1 to 3; and R_{IV} is selected from the group consisting of hydrogen, halogens and alkoxy, phenyl and carbonamido groups, $-COOR_V$ and $-NHCOOR_V$ wherein R_V is selected from substituted and unsubstituted alkyl and aryl groups.

Although it is typical that the coupler moiety included in the developer inhibitor-releasing coupler forms an image dye corresponding to the layer in which it is located, it may also form a different color as one associated with a different film layer. It may also be useful that the coupler moiety included

in the developer inhibitor-releasing coupler forms colorless products and/or products that wash out of the photographic material during processing (so-called "universal" couplers).

A compound such as a coupler may release a PUG directly upon
 5 reaction of the compound during processing, or indirectly through a timing or linking group. A timing group produces the time-delayed release of the PUG such groups using an intramolecular nucleophilic substitution reaction (U.S. 4,248,962); groups utilizing an electron transfer reaction along a conjugated system (U.S. 4,409,323; 4,421,845; 4,861,701, Japanese Applications 57-188035;
 10 58-98728; 58-209736; 58-209738); groups that function as a coupler or reducing agent after the coupler reaction (U.S. 4,438,193; U.S. 4,618,571) and groups that combine the features describe above. It is typical that the timing group is of one of the formulas:

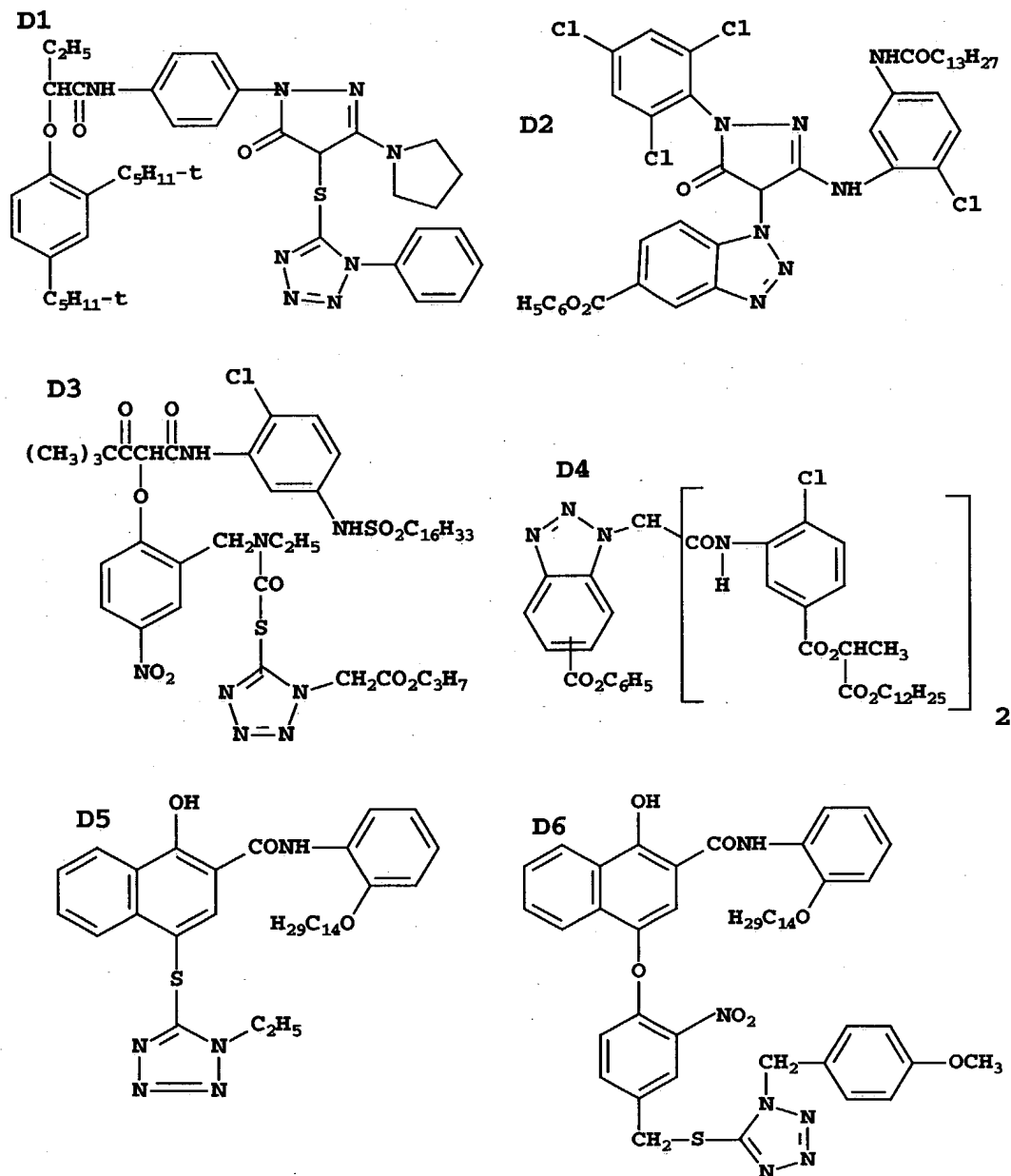


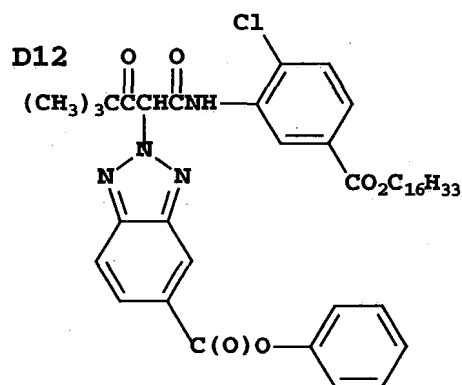
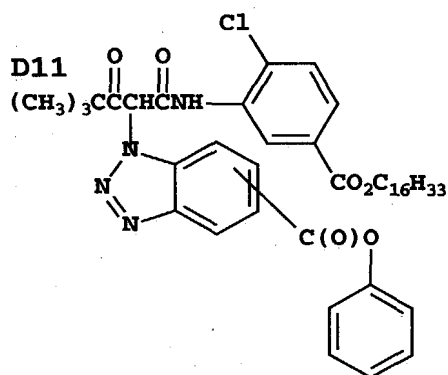
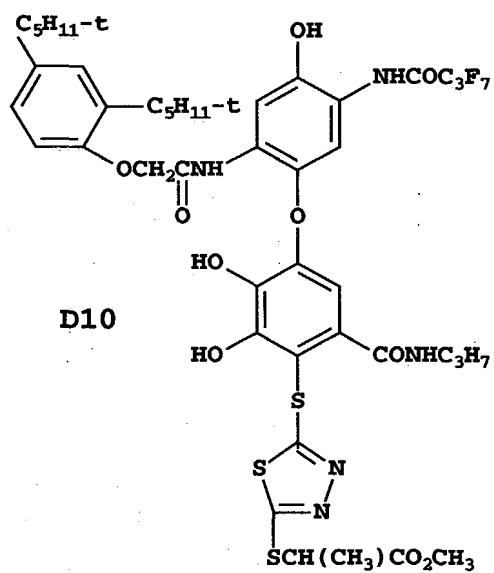
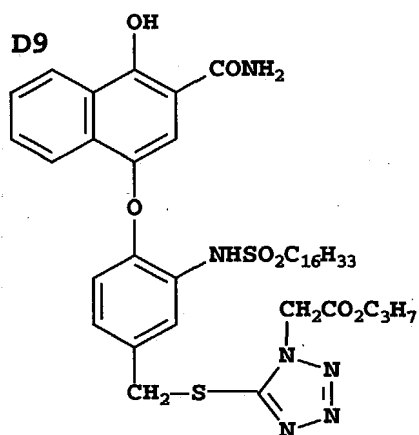
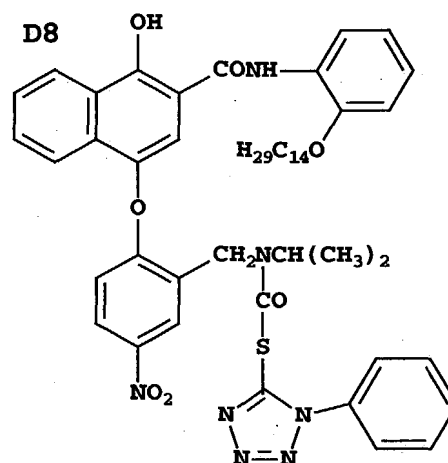
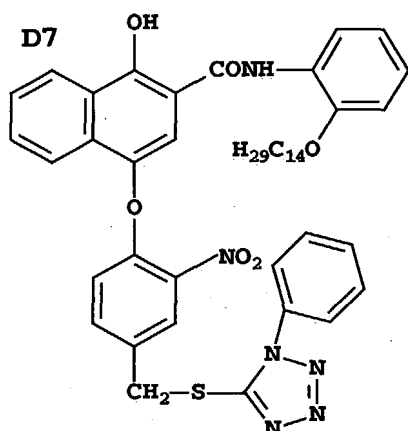
15 wherein IN is the inhibitor moiety, R_{VII} is selected from the group consisting of nitro, cyano, alkylsulfonyl; sulfamoyl; and sulfonamido groups; a is 0 or 1; and R_{VI} is selected from the group consisting of substituted and unsubstituted alkyl and phenyl groups. The oxygen atom of each timing group is bonded to the
 20 coupling-off position of the respective coupler moiety of the DIAR.

The timing or linking groups may also function by electron transfer down an unconjugated chain. Linking groups are known in the art under various names. Often they have been referred to as groups capable of utilizing a hemiacetal or iminoketal cleavage reaction or as groups capable of utilizing a
 25 cleavage reaction due to ester hydrolysis such as U.S. 4,546,073. This electron transfer down an unconjugated chain typically results in a relatively fast

decomposition and the production of carbon dioxide, formaldehyde, or other low molecular weight by-products. The groups are exemplified in EP 464,612, EP 523,451, U.S. 4,146,396, Japanese Kokai 60-249148 and 60-249149.

Suitable developer inhibitor-releasing couplers for use in the present invention include, but are not limited to, the following:





It is also contemplated that the present invention may be employed to obtain reflection color prints as described in Research Disclosure, November

1979, Item 18716, available from Kenneth Mason Publications, Ltd, Dudley Annex, 12a North Street, Emsworth, Hampshire P0101 7DQ, England. Materials useful in the invention may be coated on pH adjusted support as described in U.S. 4,917,994; on a support with reduced oxygen permeability (EP 553,339); with
5 epoxy solvents (EP 164,961); with nickel complex stabilizers (U.S. 4,346,165; U.S. 4,540,653 and U.S. 4,906,559 for example); with ballasted chelating agents such as those in U.S. 4,994,359 to reduce sensitivity to polyvalent cations such as calcium; and with stain reducing compounds such as described in U.S. 5,068,171. Other compounds useful in combination with the invention are disclosed in
10 Japanese Published Applications described in Derwent Abstracts having accession numbers as follows: 90-072,629, 90-072,630; 90-072,631; 90-072,632; 90-072,633; 90-072,634; 90-077,822; 90-078,229; 90-078,230; 90-079,336; 90-079,337; 90-079,338; 90-079,690; 90-079,691; 90-080,487; 90-080,488; 90-080,489; 90-080,490; 90-080,491; 90-080,492; 90-080,494; 90-085,928; 90-
15 086,669; 90-086,670; 90-087,360; 90-087,361; 90-087,362; 90-087,363; 90-087,364; 90-088,097; 90-093,662; 90-093,663; 90-093,664; 90-093,665; 90-093,666; 90-093,668; 90-094,055; 90-094,056; 90-103,409; 83-62,586; 83-09,959.

Conventional radiation-sensitive silver halide emulsions can be
20 employed in the practice of this invention. Such emulsions are illustrated by *Research Disclosure*, Item 38755, September 1996, I. Emulsion grains and their preparation.

Especially useful in this invention are tabular grain silver halide emulsions. Tabular grains are those having two parallel major crystal faces and
25 having an aspect ratio of at least 2. The term "aspect ratio" is the ratio of the equivalent circular diameter (ECD) of a grain major face divided by its thickness (t). Tabular grain emulsions are those in which the tabular grains account for at least 50 percent (preferably at least 70 percent and optimally at least 90 percent) of the total grain projected area. Preferred tabular grain emulsions are those in
30 which the average thickness of the tabular grains is less than 0.3 micrometer (preferably thin--that is, less than 0.2 micrometer and most preferably ultrathin--that is, less than 0.07 micrometer). The major faces of the tabular grains can lie in

either {111} or {100} crystal planes. The mean ECD of tabular grain emulsions rarely exceeds 10 micrometers and more typically is less than 5 micrometers.

In their most widely used form tabular grain emulsions are high bromide {111} tabular grain emulsions. Such emulsions are illustrated by Kofron
5 et al U.S. Patent 4,439,520, Wilgus et al U.S. Patent 4,434,226, Solberg et al U.S. Patent 4,433,048, Maskasky U.S. Patents 4,435,501,, 4,463,087 and 4,173,320, Daubendiek et al U.S. Patents 4,414,310 and 4,914,014, Sowinski et al U.S. Patent 4,656,122, Piggin et al U.S. Patents 5,061,616 and 5,061,609, Tsaur et al U.S. Patents 5,147,771, '772, '773, 5,171,659 and 5,252,453, Black et al 5,219,720 and
10 5,334,495, Delton U.S. Patents 5,310,644, 5,372,927 and 5,460,934, Wen U.S. Patent 5,470,698, Fenton et al U.S. Patent 5,476,760, Eshelman et al U.S. Patents 5,612,,175 and 5,614,359, and Irving et al U.S. Patent 5,667,954.

Ultrathin high bromide {111} tabular grain emulsions are illustrated by Daubendiek et al U.S. Patents 4,672,027, 4,693,964, 5,494,789,
15 5,503,971 and 5,576,168, Antoniades et al U.S. Patent 5,250,403, Olm et al U.S. Patent 5,503,970, Deaton et al U.S. Patent 5,582,965, and Maskasky U.S. Patent 5,667,955.

High bromide {100} tabular grain emulsions are illustrated by Mignot U.S. Patents 4,386,156 and 5,386,156.

20 High chloride {111} tabular grain emulsions are illustrated by Wey U.S. Patent 4,399,215, Wey et al U.S. Patent 4,414,306, Maskasky U.S. Patents 4,400,463, 4,713,323, 5,061,617, 5,178,997, 5,183,732, 5,185,239, 5,399,478 and 5,411,852, and Maskasky et al U.S. Patents 5,176,992 and 5,178,998. Ultrathin high chloride {111} tabular grain emulsions are illustrated by Maskasky U.S.
25 Patents 5,271,858 and 5,389,509.

High chloride {100} tabular grain emulsions are illustrated by Maskasky U.S. Patents 5,264,337, 5,292,632, 5,275,930 and 5,399,477, House et al U.S. Patent 5,320,938, Brust et al U.S. Patent 5,314,798, Szajewski et al U.S. Patent 5,356,764, Chang et al U.S. Patents 5,413,904 and 5,663,041, Oyamada
30 U.S. Patent 5,593,821, Yamashita et al U.S. Patents 5,641,620 and 5,652,088, Saitou et al U.S. Patent 5,652,089, and Oyamada et al U.S. Patent 5,665,530. Ultrathin high chloride {100} tabular grain emulsions can be prepared by

nucleation in the presence of iodide, following the teaching of House et al and Chang et al, cited above.

The emulsions can be surface-sensitive emulsions, i.e., emulsions that form latent images primarily on the surfaces of the silver halide grains, or the emulsions can form internal latent images predominantly in the interior of the silver halide grains. The emulsions can be negative-working emulsions, such as surface-sensitive emulsions or unfogged internal latent image-forming emulsions, or direct-positive emulsions of the unfogged, internal latent image-forming type, which are positive-working when development is conducted with uniform light exposure or in the presence of a nucleating agent. Tabular grain emulsions of the latter type are illustrated by Evans et al. U.S. 4,504,570.

Photographic elements can be exposed to actinic radiation, typically in the visible region of the spectrum, to form a latent image and can then be processed to form a visible dye image. Processing to form a visible dye image includes the step of contacting the element with a color-developing agent to reduce developable silver halide and oxidize the color-developing agent. Oxidized color developing agent in turn reacts with the coupler to yield a dye. If desired "Redox Amplification" as described in Research Disclosure XVIIIIB(5) may be used.

A "color negative element" utilizes negative-working silver halide and provides a negative image upon processing. A first type of such element is a capture element, which is a color negative film that is designed for capturing an image in negative form rather than for viewing an image. A second type of such an element is a direct-view element that is designed, at least in part, for providing a positive image viewable by humans.

In the capture element, speed (the sensitivity of the element to low light conditions) is usually critical to obtaining sufficient image in such elements. Such elements are typically silver bromiodide emulsions coated on a transparent support and are sold packaged with instructions to process in known color negative processes such as the Kodak C-41 process as described in The British Journal of Photography Annual of 1988, pages 191-198. If a color negative film element is to be subsequently employed to generate a viewable projection print as

for a motion picture, a process such as the Kodak ECN-2 process described in the H-24 Manual available from Eastman Kodak Co. may be employed to provide the color negative image on a transparent support. Color negative development times are typically 3' 15" or less and desirably 90 or even 60 seconds or less.

5 A direct-view photographic element is one which yields a color image that is designed for human viewing (1) by reflected light, such as a photographic paper print, (2) by transmitted light, such as a display transparency, or (3) by projection, such as a color slide or a motion picture print. These direct-view elements may be exposed and processed in a variety of ways. For example, 10 paper prints, display transparencies, and motion picture prints are typically produced by digitally printing or by optically printing an image from a color negative onto the direct-viewing element and processing through an appropriate negative-working photographic process to give a positive color image. The element may be sold packaged with instructions for digital printing or for 15 processing using a color negative optical printing process, for example the Kodak RA-4 process, as generally described in PCT WO 87/04534 or U.S. 4,975,357, to form a positive image. Color projection prints may be processed, for example, in accordance with the Kodak ECP-2 process as described in the H-24 Manual. Color print development times are typically 90 seconds or less and desirably 45 or 20 even 30 seconds or less. Color slides may be produced in a similar manner but are more typically produced by exposing the film directly in a camera and processing through a reversal color process or a direct positive process to give a positive color image. The foregoing images may also be produced by alternative processes such as digital printing.

25 Each of these types of photographic elements has its own particular requirements for dye hue, but in general they all require cyan dyes whose absorption bands are less deeply absorbing (that is, shifted away from the red end of the spectrum) than color negative films. This is because dyes in direct-view elements are selected to have the best appearance when viewed by human eyes, 30 whereas the dyes in image capture materials are designed to best match the needs of the printing process.

A reversal element is capable of forming a positive image without optical printing. To provide a positive (or reversal) image, the color development step is preceded by development with a non-chromogenic developing agent to develop exposed silver halide, but not form dye, and followed by uniformly fogging the element to render unexposed silver halide developable. Such reversal elements are typically sold packaged with instructions to process using a color reversal process such as the Kodak E-6 process as described in The British Journal of Photography Annual of 1988, page 194. Alternatively, a direct positive emulsion can be employed to obtain a positive image.

The above elements are typically sold with instructions to process using the appropriate method such as the mentioned color negative (Kodak C-41), color print (Kodak RA-4), or reversal (Kodak E-6) process.

The photographic element of the invention can be incorporated into exposure structures intended for repeated use or exposure structures intended for limited use, variously referred to by names such as "single use cameras", "lens with film", or "photosensitive material package units".

Preferred color developing agents are *p*-phenylenediamines such as:

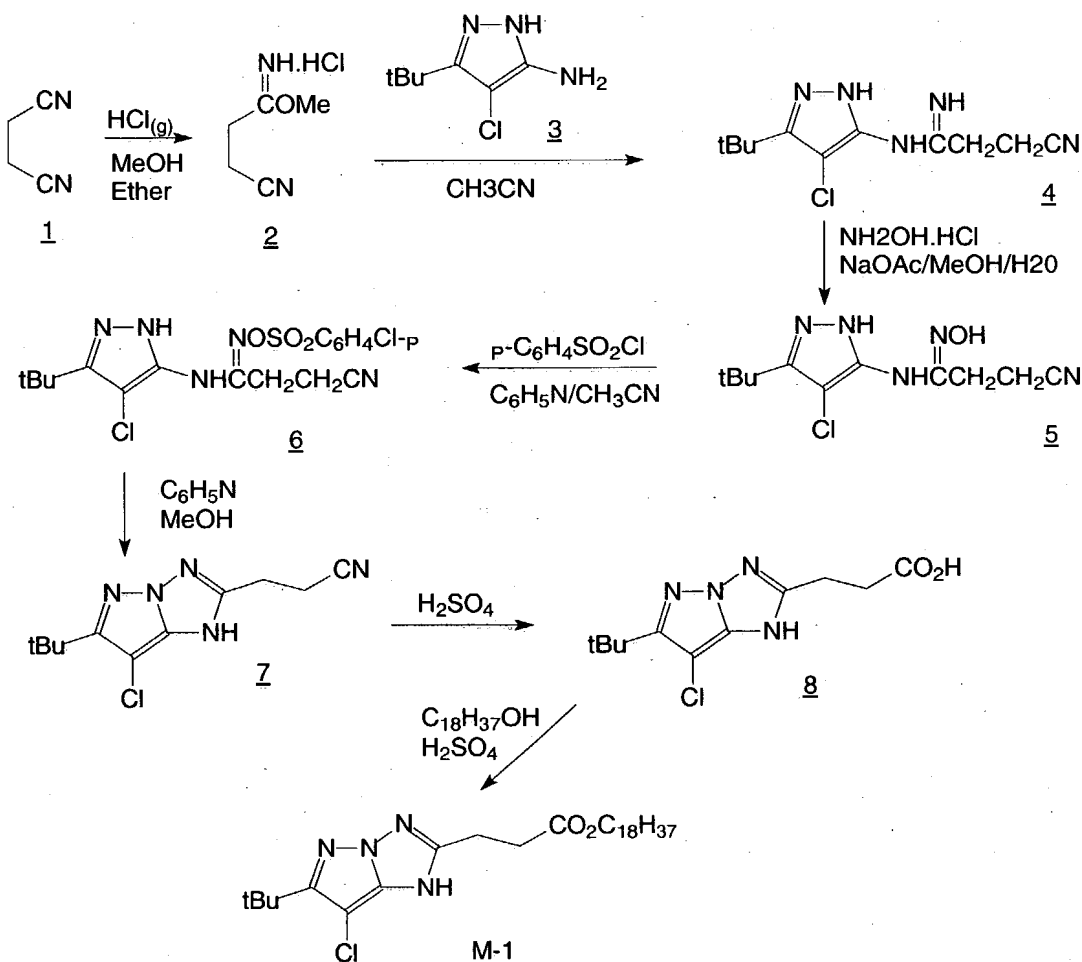
4-amino-N,N-diethylaniline hydrochloride,
4-amino-3-methyl-N,N-diethylaniline hydrochloride,
4-amino-3-methyl-N-ethyl-N-(2-methanesulfonamidoethyl)aniline sesquisulfate hydrate,
4-amino-3-methyl-N-ethyl-N-(2-hydroxyethyl)aniline sulfate,
4-amino-3-(2-methanesulfonamidoethyl)-N,N-diethylaniline hydrochloride, and
4-amino-N-ethyl-N-(2-methoxyethyl)-*m*-toluidine di-*p*-toluene sulfonic acid.

Development is usually followed by the conventional steps of bleaching, fixing, or bleach-fixing, to remove silver or silver halide, washing, and drying.

The synthesis of compounds of the invention are carried out by standard methods. The synthesis of M-1 is shown below for illustrative purposes.

EXAMPLES

SYNTHESIS OF M-1



5

Synthesis of imino ether 1:

42.9 g malonitrile 1 was dissolved in 400 ml ethyl ether, 100 ml methylene chloride, and 21.4 ml methanol and cooled to 10°C in an ice bath. Hydrogen chloride gas was bubbled through for 30 minutes at such a rate to keep the temperature under 20°C. After 15 minutes a white solid started precipitating. After storing in the refrigerator over the weekend the while solid was filter off and washed with ethyl ether and dried under nitrogen to yield 78.4g of product 1.

10

Formation of amidine 4:

15m of aminopyrazole 3 and 12.9 g of imino ether 2 were stirred together in 150ml acetonitrile at ice bath temperature. The ice let melt and the reaction stirred ambient temperatures overnight. 24g pink solid was filtered off and used
5 in the next step.

Formation of oxime 5:

24 g 4 and 8.7 g hydroxylamine hydrochloride stirred in 200 ml methanol and 12 g sodium acetate in 24 ml water added over 5 minutes. The mixture refluxed one
10 hour, most of the solvent evaporated off and the residue dissolved in ethylacetate and washed 3times with brine, dried over MgSO₄ and evaporated. The residue crystallized from ethylacetate/heptane (70/30) to yield 6 g white solid.

Formation of 6:

15 6 g 5 dissolved in 50 ml THF, cooled to ice bath temperature and 4.6 g p-chlorobenzenesulfonyl chloride added followed by 1.8ml pyridine. After two minutes the ice bath was removed and the mixture stirred over the weekend. The reaction dissolved in ethyl acetate and washed with dilute HCl followed by water and the organic layer dried over MgSO₄ and evaporated to an off white solid.

20

Formation of 7:

7.5 g of 6, 1.4 ml pyridine, and 80 ml of methanol were refluxed 5 hours. The reaction poured into dilute HCl, ethyl acetate added and the organic layer washed 3 times with water, dried over MgSO₄ and evaporated to a brown solid.

25 Trituration with isopropyl ether gave 2.9 gram pure product.

Formation of 8:

3.7 g 7 refluxed with 120ml water and 120 ml sulfuric acid for one hour. The reaction diluted with water and the product filtered off and dried.

30

Formation of M-1:

0.5 g 8 was stirred with 1.0 gm of octadecanol containing 4 drops of sulfuric acid for 3 days. 4 more drops acid added and after 3 more days water and ethyl acetate was added and the organic layer washed 3 times with water and dried over MgSO_4 and evaporated. The residue chromatographed on SiO_2 with 30% ethyl acetate in heptane and crystallized from acetonitrile to give .35 g M-1 as a white solid, .mp 62°C .

PHOTOGRAPHIC EXAMPLE

10 The invention was evaluated in a coating containing a single coupler and consisting of 3 layers. Evaluations were made based on samples of these coatings. The invention will be described in more detail using coating experiment 1, however the invention is not limited to this experiment. Dispersions of example couplers, were emulsified by methods well known to the art, and were coated on 15 the face side of a doubly extruded polyethylene coated color paper support using conventional coating techniques. The gelatin layers were hardened with bis (vinylsulfonyl methyl) ether at 1.8 % of the total gelatin.

Experiment 1 was made by coating photosensitive emulsions on a resin-coated 20 photographic support with 3.22 g/m^2 of gelatin as base.

Experiment 1

1st layer- Magenta Coupler Layer

25

Gelatin	1.44 g/m^2
Compound M-1	0.04 mmol
High Boiling Organic Solvent/coupler ratio	4
Stabilizer 1/coupler molar ratio	0.367
30 Stabilizer 2/coupler molar ratio	1.698
Emulsion for Magenta Emulsion	0.107 g/m^2
(Fine Grain silver iodide emulsion, average equivalent grain size $0.64 \mu\text{m}$)	

2nd layer UV Absorbing Layer

Gelatin

1.40 g/m²

UV Absorbent

0.613 g/m²

5

3rd Layer Protective Layer

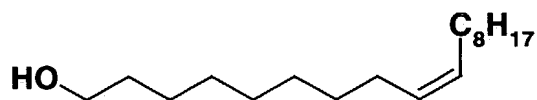
Gelatin

1.40 g/m²

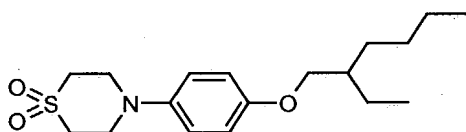
Gel Hardening Compound BVSME

1.8% of total gel

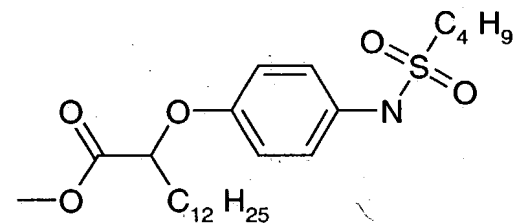
10 High Boiling Organic Solvent



Stabilizer 1

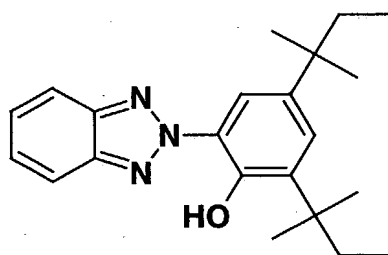


Stabilizer 2



15

UV Absorbent



20

Once the coated paper samples described above had been prepared, they were given a preliminary evaluation as follows:

The respective paper samples were exposed in a Kodak Model 1B sensitometer with a color temperature of 3000° K and filtered with a Kodak Wratten™ 2C plus a Kodak Wratten™ 29 filter and a Hoya HA-50. Exposure time was adjusted to 0.1 seconds. The exposures were performed by contacting the paper samples with a neutral density step exposure tablet having an exposure range of 0 to 3 log-E.

The paper samples described above were processed in the Kodak Ektacolor RA-4 Color Development™ process. The color developer and bleach-fix formulations are described below in Tables 1 and 2. The chemical development process cycle is described in Table 3.

Table 1

Kodak Ektacolor™ RA-4 Color Developer

Chemical	Grams/Liter
Triethanol amine	12.41
Phorwite REU™	2.30
Lithium polystyrene sulfonate (30%)	0.30
N,N-diethylhydroxylamine (85%)	5.40
Lithium sulfate	2.70
Kodak color developer CD-3 (with 4-amino-3-methyl-N-ethyl-N-(2-methanesulfonamidoethyl)aniline sesquisulfate hydrate developer)	5.00
DEQUEST 2010™ (1-Hydroxyethyl-1,1-diphosphonic acid (60%))	1.16
Potassium carbonate	21.16
Potassium bicarbonate	2.79
Potassium chloride	1.60

Potassium bromide	0.007
Water	to make 1 liter

pH @ 26.7°C is 10.04 +/- 0.05

Table 2

Kodak Ektacolor™ RA-4 Bleach-Fix

Chemical	Grams/Liter
Ammonium thiosulfate (56.5%)	127.40
Sodium metabisulfite	10.00
Glacial acetic acid	10.20
Ammonium ferric EDTA (44%)	110.40
Water	to make 1 liter

pH @ 26.7°C is 5.5 +/- 0.10

5

Table 3

Kodak Ektacolor™ RA-4 Color Paper Process


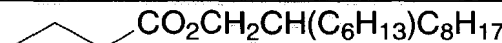
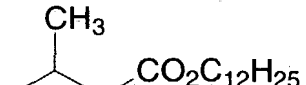



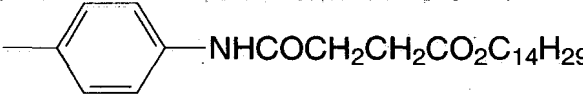
Process Step	Time (seconds)
Color Development	45
Bleach-fix	45
Wash	90
Dry	

10

Processing the exposed paper samples is performed with the developer and bleach-fix temperatures adjusted to 35°C. Washing is performed with tap water at 32.2°C. The samples were evaluated for hue as shown in Table 4 below.

TABLE 4

Results

COUPLER	STRUCTURE of 2-Substituent	$\Delta\lambda_{\max}$ (C-3 - Sample)* in nm
M-1	 <chem>CCCCCCCC(=O)OCCCC</chem>	3.5
M-2	 <chem>CCCCCCCC(=O)OCCc1ccc(CCCCCC)cc1</chem>	4.1
M-3	 <chem>CCCCCCCC(=O)OCCc1ccc(C)cc1</chem>	5.9
M-4	 <chem>CCCCCCCC(=O)OCCCC</chem>	5.6
C-1	 <chem>CCCCCCCC(=O)NCCCC</chem>	-1.7
C-2	 <chem>CCCCCCCC(=O)OCCCC</chem>	-0.1
C-3	 <chem>CCCCCCCC(=O)NCCc1ccc(cc1)C(=O)OCCCC</chem>	0**

* Hypso shift from C-3

** Average value for C-3 comparison = 552.5nm

5 As can be seen from the table, couplers of this invention (M-1, M-2, M-3, M-4) have hues hypsochromic to the check couplers (C-1, C-2, C-3) and are in the desirable 546 to 549 range. The check couplers exhibit maximum absorptions above 549nm.

10 The invention has been described in detail with particular reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the scope of the invention. The entire contents of the patents and other publications referred to in this specification are incorporated herein by reference.